THE EYES OF SCHOOL CHILDREN.

At the last annual meeting of the American Medical Association, the House of Representatives, on the recommendation of the Ophthalmological Section, passed the following:

Resolved, That it is advised by the American Medical Association that measures be taken by the various school authorities and boards of education, boards of health, and if possible, state legislators, to secure examinations of the eyes and ears of all school children in this country, with a view to the suitable treatment for the relief of the opthalmologic and otologic imperfections.

In accordance with this resolution Prof. Geo. L. Leslie, of the Los Angeles High School, has prepared the following leaflet for the use of the teachers of Los Angeles:

Los Angeles City Public Schools,
October, 1903.

SCHOOL HYGIENE LEAFLET.—EYE-SIGHT OF PUPILS.

THE EYE—NORMAL ACTION, DEFECTS, TESTS, HYGIENE.

"The average person knows little about his eyes. Perhaps he does not need to know much about them, but he should know at least this much. He should understand the action of the eyes; what eye defects are and what they mean. Knowing this, he is guarded against serious eye dangers."

THE NORMAL EYE.—In the normal eye rays of light from distant objects are brought to a focus on the retina without action of the muscles of accommodation. The focal length of the lens equals the axis of the eyeball. The eye is at rest when looking at distant objects.

Without *change of the lens* the focus of rays of light from near objects is behind the retina. That the image be sharply focused upon the retina, the lens must become more convex.

The lens continually changes its convexity as the eye looks at far and near objects.

The normal eye maintains such change without fatigue.

The eye in infancy is an undeveloped eye composed of growing tissues: the flat eye, underfocused. It is not adapted for *near work*. Development proceeds at an *uncertain rate*. The developed form of the eye precedes the full growth of the body by only a few years.

The relation of the nervous mechanism of vision to other nerve centers is so vital and close that the observance of proper hygienic condition of the eyes is most important to the general health and development of children and to the working ability of adults.

ACCOMMODATION.—In principle the eye is an optical instrument like the photographic camera. They differ in this: In the camera the convexity of the lens does not change. For objects at different distances the ground glass of the camera changes its distance from the lens.

In the eye the *distance* from the lens to the retina remains unchanged. The lens continually changes its convexity as we look at objects at different distances. The change in the convexity of the lens (accommodation) is brought about by the ciliary muscle and suspensory ligament. The lens is held in place by the suspensory ligament, the tension of which is controlled by the ciliary muscle. By the contraction of the muscle the ligament relaxes and the lens, by reason of its inherent elasticity, bulges forward and becomes more convex.

When the lens is at its flattest, it is said to be accommodated for distance vision. When the lens is at its greatest convexity, it is said to be accommodated for the *near point*.

In children the power of accommodation is remarkable. The near point is about three inches from the eyes. At ten years the near point commences steadily to recede, but holds during adult life, to the age of forty-five, at from twelve to fourteen inches.

Reading, writing and all near work are effected by muscular exertion causing an increased convexity of the lens.

DEFECTS—(1) **Hyperopia** (far-sightedness): The flat or undeveloped eye.

The axis of the eye is too short.

Rays of light from distant objects come to a focus behind the retina. If the eye is at rest the images, even of distant objects, are blurred.

The eye is never at rest during waking hours. Continued eye strain exists.

Where hyperopia is marked, by reason of the short axis of the eye, the face shows a want of relief.

Accommodation is strong and distant vision may be maintained without apparent fatigue. Pupils see board-work well.

Near vision, however, gives rise to fatigue.

Children read well at the beginning of a paragraph, but blunder toward the end. They may seem inattentive. Pupils with this defect tend to exhibit an unusual amount of blinking and winking.

Headaches, redness and soreness of the lids, inflammation of the eyes often exists.

This continued eye strain reduces the circulation, diminishes the nutrition, and thus takes away the energy which would otherwise go to aid in the normal development of the eye and in the doing of useful work.

(2) **Myopia** (near-sightedness): The elongated eye.

The axis of the eye is too long.

Rays of light from distant objects come to a focus before they reach the retina. A short-sighted person sees clearly at a definite distance; it may be a few feet or only a few inches. Everything beyond this point is hazy and ill-defined.

It is by far the most important condition of the eyes to look after, because the school work is more or less responsible for it. It is a condition very largely induced by the *misuse* of *eyes* during the *period of growth*.

A near-sighted child reads well from the book, but does not see the board-work well. He may make all sorts of awkward mistakes. It is most common between the ages of ten and fourteen.

That which is to be particularly avoided is the employment of the eyes at *fine work* at *short distance*. The continued and almost continual convergence of the eyes of a near-sighted person in time gradually elongates the eyeball. This increase in the length of the axis necessitates that all work be brought a little nearer than before, and thus myopia increases, and continues to increase. This continual eye strain reduces the circulation and consequently the nutrition. Where myopia is at all marked, serious and far-reaching consequences result in middle age and later life.

The remedy is the wearing of proper glasses, relieving the eye strain and giving the eyes an opportunity to *normally develop*.

Children and older persons who are near-sighted usually stoop and become round shouldered from their habit of poring over their work. This stooping at near work tends to produce congestion of the eyes.

Near-sighted persons usually show a prominence of the eyeball, but not always. The forehead shows wrinkles or furrows. Near-sighted eyes are *weak eyes*

of poor resistance and in a majority of cases continually giving trouble.

(3) **Astigmatism:** In astigmatism the eyeball is not spherical. The eyeball has a greater curvature in one direction than in some other, usually at or near the vertical and horizontal meridians. Because of this unequal curvature the focus may be either in front or behind the retina or both, but by different amounts. Marked cases of astigmatism give rise to much trouble, but nearly all eyes are slightly astigmatic, and the eye overcomes minor defects without trouble.

(4) **Muscular Imbalance:** The eyeball is moved by six muscles. The superior, inferior, internal and external recti and the superior and inferior obliques. When these muscles are rightly balanced the *visual axes* of the two eyes meet at the point of observation. When muscular imbalance exists this is not true without eye strain. The results of eye strain due to such unbalanced condition of the muscles are severe and far-reaching in their effects on the general health.

The cause of muscle deviations is usually some refractive error. The wearing of properly fitted glasses is the first thing to be done.

(a) When the internal recti are not sufficiently strong the eyes tend to turn outward—exophoria.

(b) When the external recti are not sufficiently strong the eyes tend to turn inward—esophoria.

(c) In vertical deviations, the eyes do not cooperate in upward and downward movements by reason of insufficiency of the superior or inferior recti muscles.

TESTS.—(1) General.

Find out whether there are symptoms of eye trouble, headaches, watering of the eyes, red or swollen lids, fatigue in reading, reading with the book too close to the eyes, trouble in reading work at the board, strained look characteristic of weak eyes; eyes too prominent or eyes seemingly set too far back in the sockets; wrinkles or furrows on the forehead; general poor health.

(2) Snellen's Test Types.

(a) Hang the card in a good light on a level with the child's eyes.

(b) Test one eye at a time, keeping the other eye open and properly covered. (Place a piece of cardboard in front of the eye). Do not allow the child to press or touch the covered eye with the hand. It is customary to test the right eye first.

(c) Have the child take a seat twenty feet from the card. Ask him to read the rows of letters on the card, commencing at the top. Note the lowest line read correctly. If the child cannot read let him paint or draw the letters which he sees clearly.

(d) Write the record of the child's vision in the school register with a *visual fraction* 20/20 if the vision is normal.

$$\text{The visual fraction—d/D} = \frac{\textit{Distance from the chart.}}{\text{Type read.}}$$

The numerator is the distance of normal vision for the type marked 20 feet.

The denominator is the distance of normal vision for the type read.

If the pupil reads the type marked 20 feet at 20 feet distance, the visual fraction is 20/20.

If he reads the type marked 30 feet at 20 feet distance the visual fraction is 20/30. The vision is poor, for he should read that type at 30 feet distance. Any fraction less than 20/30 indicates defective vision.

NORMAL VISION.—If the child reads all the letters or more than is expected, his eyes are probably in good condition. His visual fraction is 20/20.

Note: The child may be far-sighted and astigmatic to a considerable extent and still seem to have the normal vision. The accommodation of children is so strong that they readily overcome for a time a small or even medium amount of Hyperopia (far-sightedness). To detect Hyperopia where the vision seems to be normal:

Hold before the eye a one-half diopter convex lens. If the pupil sees *as well* with the lens as without it (not necessarily better) he is far-sighted. In testing the eye without the lens the defect was hidden by strong accommodation. If the lens *dims* his vision the eye *is* normal. Neithsr the normal eye nor the near-sighted eye will accept *any convex lens* for *distance*.

If no lens be at hand then the child's health and his behavior with regard to his work are the only guides at the command of the teacher. Such pupils require most careful consideration. If at any time, there is reason to believe there is trouble with the eyes, a good oculist should be consulted at the earliest moment.

DEFECTIVE VISION—The pupil does not readily rea(the lines indicated for normal vision. His visual fraction is 20/30, 20/40 etc., or he may be unable to read the types at all

Myopia—Bring the pupil nearer to the chart. If at some definite distance the letters stand out clear and sharp, are easily read without special effort, then the child is near-sighted, except where there is *spasm* of the *ciliary muscle.*

A child markedly far-sighted may have undergone so much strain of the ciliary muscle that *spasm* of the muscle occurs at times. In the endeavor the eye makes to accommodate itself for near objects the muscles eventually refuse to relax. Under such circumstances a far-sighted eye may appear to be near-sighted.

Hyperopia—If upon approaching the chart no distance is found at which the types stand out clear and sharp and are easily read for any length of time, then the pupil is far-sighted (except in case of spasm of the ciliary muscle).

A far-sighted person upon coming nearer the chart may see the letters plainer by reason of nearness, but the types will not stand out clear and sharp and remain so for any length of time. When nearer the chart the increased intensity of light may momentarily stimulate his accommodation so that for a moment the types will seem plain, but they will not remain.

In distinguishing between near and far-sighted eyes it is well to remember that the near point for near-sighted children is much nearer than in the case of those far-sighted.

The correction for myopia and hyperopia with proper glasses cannot be too strongly emphasized. Glasses give the eyes a chance to *develop normally.* Near-sighted eyes will only get worse if left to themselves. Again, the cause of muscular imbalance is usually some refractive error and the wearing of proper glasses relieves and prevents muscular trouble. Consult a good oculist at the earliest moment. It may not be amiss to add a word of explanation with reference to the test types.

It has been determined that the smallest retinal image perceived by the most sensitive part of the retina corresponds to a visual angle of five minutes (5"). The test types are so constructed that every letter at its proper distance subtends an angle of five minutes. No. 20 type at 20 feet, and 30 type at 30 feet, etc.

(To be continued next month.)

An International Congress of School Hygiene will be held at Nuremberg, Germany, on April 4-9, 1904. All persons interested in this subject are eligible to membership, after approval by the local committee. There will be ten sections. The American members of the committee are President Nicholas Murray Butler of Columbia University, Professor W. T. Porter of the Harvard Medical School, and Professor John A. Bergström of the University of Indiana. —*Science.*